judiciously selected, well printed, and give one the impression of illustrating the text rather than of adorning the book. This is not the case with all recent books, in some of which one suspects that pretty pictures have been used to add to the attractiveness of the pages, with only remote reference to the text.

We are told in the preface that the chief object of this book is 'to disseminate knowledge of the destructive parasites of the useful plants of Minnesota, to assist all concerned in the cultivation of plants, to a more intelligent and thorough understanding of the habits of these parasites, and to point out established methods of combating such diseases.' In carrying out this plan, the author gives about one half of the book to a general discussion of the nutrition, reproduction, life methods, and parasitism of the fungi, their rôle in plant diseases, their kinds systematically considered, the prevention of diseases, fungicides, spraying, etc. This is followed by a special discussion of diseases of timber and shade trees, timber rots, diseases of field and forage crops, garden crops, orchards and vineyards, green house and ornamental plants and wild plants. In connection with each disease, there are brief but clear suggestions as to preventive or remedial treatment. The volume must at once be in great demand in Minnesota, and, without doubt, the small edition of 2,500 copies will soon be exhausted. It is so valuable a book that it is certain to be in demand wherever there are students of plant diseases, and to meet this demand it should be placed on sale.

CHARLES E. BESSEY.
THE UNIVERSITY OF NEBRASKA.

Sea-shore Life. The Invertebrates of the New York Coast. By ALFRED G. MAYER. New York Aquarium Series, No. I. Published by the New York Zoological Society. 1905.

Dr. Mayer has succeeded in the difficult task of presenting in a readable and popular form a good deal of information regarding the habits and distribution of the lower marine animals of the coast of New York and of Long Island. A simple description of the appearance and structure of most of the forms is given that will suffice for identification. Especially noteworthy are the large number of new illustrations; most of them photographs of the living animals. While these photographs are not all of equal merit, the majority of them are excellent and valuable.

The book of some 200 pages is not intended as a guide to the New York Aquarium, but it is anticipated that many visitors whose interest has been aroused by the fine exhibit at the aquarium will be glad to learn more about the marine fauna of our coast; and a book of this kind will meet such a need. At present, it is true that the animals in the aquarium are largely fishes and a few other vertebrates, but with the completion of the new salt water system that is now being introduced it will be possible to keep alive many of the more delicate invertebrate forms. When this change occurs the first volume of the New York Nature Series will form a useful compendium to the visitor who desires to study the animals in the aquarium as well as to see them.

Two features of Dr. Mayer's book seem to us to be especially noteworthy. In the introductory statement the theory of evolution is presented in a modest and undogmatic spirit, that will recommend itself to most readers. In the second place many references to more special works are scattered through the text, so that the tyro will be able to follow up any special subject that may excite his interest.

The book is clearly printed and presents a very attractive appearance. It ought to prove useful as well as attractive.

T. H. MORGAN.

SOCIETIES AND ACADEMIES.

THE AMERICAN MATHEMATICAL SOCIETY.

THE one hundred and twenty-fifth regular meeting of the American Mathematical Society was held at Columbia University, on Saturday, October 28. The simultaneous meeting of the American Physical Society afforded an agreeable opportunity for the renewal of cordial relations among the members of the two organizations. The attendance at the morning and afternoon sessions of the Mathematical So-

ciety included thirty members. President W. F. Osgood occupied the chair. The following new members were elected: Professor O. P. Akers, Allegheny College; Dr. R. B. Allen, Clark University; Professor Ernesto Cesàro, University of Naples; Lieutenant Colonel A. J. C. Cunningham, London, Eng.; Miss M. E. Decherd, University of Texas; Mr. W. W. Hart, Shortridge High School, Indianapolis, Ind.; Mr. H. N. Olsen, Bethany College; Mr. F. H. Smith, Southwestern Christian College. Twelve applications for membership in the society were received. The total membership of the society is now 503.

A list of nominations for officers and other members of the council was adopted and ordered placed on the official ballot for the annual election at the December meeting. Dr. W. H. Bussey was appointed assistant secretary of the society.

A committee consisting of Professors Maschke, Pierpont, P. F. Smith, H. S. White, and the secretary were appointed to arrange for the summer meeting and colloquium to be held at Yale University in 1906.

The following papers were read at this meeting:

W. B. Carver: 'On the Cayley-Veronese class of configurations.'

James Pierpont: 'Multiple improper integrals.'

Edward Kasner: 'On the geodesics passing through a given point of a surface.'

H. S. White: 'Poncelet quadrilaterals on a curve of the third order and a conic.'

Max Mason and Professor G. A. Bliss: 'A problem of the calculus of variations in which the integrand function is discontinuous.'

G. A. Miller: 'Groups generated by two operators which transform each other into the same power.'

Burke Smith: 'Determination of associated surfaces.'

L. P. Eisenhart: 'Certain triply orthogonal systems of surfaces.'

The next meeting of the society, which will be the annual meeting for the election of officers, will be held at Columbia University, on Thursday and Friday, December 28–29. The American Physical Society and the Astronomical and Astrophysical Society of America will meet at the same place and time.

The Chicago Section of the Mathematical Society will meet at the University of Chicago, on December 29–30.

F. N. Cole,
Secretary.

THE AMERICAN CHEMICAL SOCIETY.
NORTHEASTERN SECTION.

The sixty-second regular meeting of the section was held Friday evening, October 27, in the Walker Building, Massachusetts Institute of Technology, with President Norris in the chair. About 250 members and guests were present. The report of the nominating for officers for 1905–6 was accepted.

Professor Wilhelm Ostwald, of Leipzig, Germany, gave a lecture on the 'Development of Chemistry in France, England, Germany and the United States,' in which he said in part, that chemistry had its earliest development in France, but owing to the centralizing methods of Napoleon I., science had always been monarchical in its tendencies in that country. There had always been a central leader at Paris, who played the rôle of 'king' in chemistry; the succession being Lavoisier, Fourcrois, Berthollet, Gay-Lussac, Dumas, Würtz and Berthelot, the present ruler, with Moissan already elected the next 'king.' The result had been to greatly retard the advance of the science. Berthelot, for instance, had been able to impose his theories on the whole country, so that it was not until recently in French journals that molecular notation had replaced the older equivalent notation. The doctrine of the conservation of energy was first mentioned in a French journal ten years after its discovery, and the same is true of the theory of electrolytic dissociation. Although lately important discoveries have been made by Becquerel, the Curies, etc., this has been done outside of and in spite of the 'system.' In the same way as the science of chemistry has had one person at its head, it has been centralized in one place, Paris, and very little chemical work has been done in the rest of France.

The opposite conditions have existed in England, where individualism has been the rule. Boyle, Priestley, Cavendish, Davy,

Faraday and others were not connected with the government, and had no encouragement or support from it.

In Germany, which consisted of thirty-six separate different countries during the development of chemistry, there has been a large number of centers of science and independent thinkers. At first Germany was far behind France and England. Liebig was the one who brought about the change. His great discovery of the method of laboratory teaching, of personal teaching supplementing mass teaching in lectures, together with the development of research work as a requisite for graduation at a German university, has led to the enormous development of the science of chemistry in Germany, so that at present over one half or nearer three fourths of the chemical investigation of the world is carried on in Germany, all of which is attributable to Liebig's methods.

In America the development of chemistry has been dependent on the development in foreign countries, and foreign methods have been introduced. At present progress is rapid and the signs are hopeful, but the connection between theoretical and applied chemistry is not so well developed as in Germany, where, at Ludwigshafen for instance, there are one hundred and fifty university graduates employed in technical work in one establishment, and the university professors and scientists in works are in close touch. Professor Ostwald illustrated the close connection of theoretical and practical chemistry in Germany by his own valuable discovery of the preparation of nitric acid from ammonia, by catalytic reactions depending on pure physico-chemical theories.

ARTHUR M. COMEY,
Secretary.

THE CHEMICAL SOCIETY OF WASHINGTON.

THE 161st regular meeting was held Thursday evening, November 9, 1905, in the Assembly Hall of the Cosmos Club. Messrs. S. S. Voorhees and L. S. Munson were elected councilors to represent the Washington Section in the American Chemical Society.

The first paper of the evening, entitled 'Polymorphic Forms of Calcium Metasilicate,' was presented by Dr. E. T. Allen.

The results of the investigation were stated as follows:

Calcium metasilicate ($CaSiO_3$) crystallizes in two different forms, the mineral wollastonite which is monoclinic, and an artificial form which is pseudo-hexagonal. These are enantiotropic polymorphs with an inversion point at 1,190°. The artificial form is more stable above this point, therefore to synthesize the mineral of nature, the melt must first be chilled to a glass, and this then devitrified below the inversion point (800° to 900°). Reversion from pseudo-wollastonite to wollastonite does not take place when the two forms are heated together below the inversion point, but this may be effected by the addition of calcium vanadate which dissolves the pseudo form from the solution of which the more stable wollastonite crystallizes. There is scarcely any volume change in the inversion, the specific gravity of the wollastonite being 2.915 and that of the pseudo-wollastonite 2.912. As an inversion temperature is a point at which two solids are in equilibrium, it remains unchanged no matter what solution the mineral may crystallize from. It is only the temperature of crystallization which is affected.

Since neither pseudo-wollastonite nor paramorphs of wollastonite after pseudo-wollastonite are found in nature, it follows that natural wollastonite has always formed below its inversion temperature; and since wollastonite is very characteristic of contact metamorphic zones, the foregoing may have an important bearing on the temperature of contact metamorphism.

The second paper, entitled 'Investigations on the Properties of Wheat Proteids,' was presented by Dr. Joseph S. Chamberlain.

The conclusions drawn were: (1) The washings from gluten determinations contain 35–40 per cent. of the proteids of wheat, of which about 15 per cent. is composed of the glutinous proteids gliadin and glutenin; (2) the cold alcoholic extract of wheat contains, with the gliadin, about 10–12 per cent. of those pro-

teids soluble in dilute salt solutions; (3) the determination of gluten seems less valuable than that of total proteids (from total nitrogen) and the only separation of proteids that seems warranted for analytical purposes is into (*a*) alcohol soluble, and (*b*) alcohol insoluble.

The last paper of the evening, upon 'The Determination of Mercury and Iodine in Antiseptic Soaps,' was presented by A. Seidell. The method described is briefly as follows: The sample of soap is dissolved in acidulated 95 per cent. alcohol and the mercury precipitated from the clear solution by a stream of hydrogen sulphide gas. After filtration, the iodine is determined in the evaporated filtrate by adding a few drops of nitrous acid, shaking out the liberated iodine with chloroform and titrating the chloroformic solution with standard sodium thiosulphate.

A. Seidell,
Secretary.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

The 605th meeting was held October 21, 1905, with President Littlehales in the chair.

Mr. F. H. Bigelow gave informally some account of the Spanish Eclipse Expedition, the three parties of which had good weather, and of the opportunities enjoyed on the voyage for meteorological observations by means of kites.

Mr. F. E. Fowle then presented 'The Seeliger-Halm theory of double stars' with lantern illustrations.

According to Seeliger a temporary star is the result of the collision of some dark star with a meteoric cloud. The star is rendered incandescent, a rapidly-expanding chromospheric envelope is formed, and it becomes accompanied by a ring of cosmic particles under its own gravitational sway. Halm shows that the expanding atmosphere may be divided into two parts: that directly between the star and the earth causing the dark band displaced towards the violet, and that part at the sides the bright band in its normal position. The superposition of the spectrum of the ring causes the apparent reversals and the changes in the displacements of the bright line. This accounts for the typical Nova spectrum. The evolutionary process of such a system, with simple modifications, accounts for many of the observed spectrum changes.

Mr. L. A. Bauer spoke of the 'Inauguration of the Magnetic Survey of the North Pacific Ocean by the Carnegie Institution of Washington.' In the prefatory remarks the present status of some of the greater problems of the earth's magnetism was set forth and it was shown that their final solution could not be expected until the completion of an accurate magnetic survey of the oceans as well as of the land, and that, however great this task might appear, it could be accomplished with good system and management, and ample funds, within a period of from ten to fifteen years.

The Carnegie Institution of Washington has undertaken to do its part in the removal of this hindrance to progress in terrestrial magnetism by making an initial allotment of $20,000 to inaugurate a magnetic survey in that portion of the oceanic areas—the North Pacific Ocean—where data are especially scarce; practically only results along one line, passing from New Zealand to the Hawaiian Islands and to Yokohoma, from accurate magnetic observations having been secured thirty years ago by the *Challenger* expedition. The cooperation of existing magnetic institutions is likewise assured through the action of the International Committee on Terrestrial Magnetism and Atmospheric Electricity, which met at Innsbruck, Austria, last September.

A brief summary was given of previous expeditions and then with the aid of lantern slides views were shown of the Carnegie Institution vessel, the fast-sailing wooden *Galilee*, and of the instruments, accompanied by a description of them and of methods in use. The four instruments enable the three magnetic quantities to be observed in duplicate.

In conclusion it was shown that whenever conditions of weather and sea permitted the making of the magnetic observations on equidistant headings of the vessel for a complete 'swing' forward and back, the average results obtained possessed a very high order of ac-

curacy, and that if it were necessary to still further increase the accuracy of the results, this could be done by spending additional time in the observations. When observations can not be secured on a complete 'swing,' but simply on the regular course of the ship, it is not always possible to mathematically control the deviation corrections applied, owing to accidental conditions entering in. While these corrections in the case of the vessel employed are comparatively small as compared with those of other expeditions, they are of sufficient amount to require being taken into account in securing data of the precision requisite for the solution of some of the greater problems referred to above. Considerable time would be saved were it possible to have a vessel entirely non-magnetic so that the question as to corrections to be applied on account of magnetism of any portions of the ship need not be considered.

The results thus far secured by the *Galilee* on her cruises from San Francisco to San Diego and from there to the Hawaiian Islands, as well as some results obtained by the Coast Survey vessel in the Pacific Ocean—the *Patterson*—proved that the latest magnetic charts are systematically in error, as far as the magnetic declination is concerned, to the extent of from one to two degrees, the charts giving too low values of easterly declination. The lines of equal dip appear to be correct on the average within about one third of a degree. The lines of equal horizontal intensity are systematically erroneous to the extent of one twentieth to one thirtieth part of the absolute value—fully ten times the error of the observation—the charts giving too high values. A consideration of the values obtained by the Coast Survey vessels in the Atlantic Ocean, especially between Baltimore and Porto Rico, likewise shows that the intensity charts give values too great by about the same ratio as in the case of that portion of the North Pacific Ocean considered above.

The president followed with some extended remarks on the subject.

THE 606th meeting was held November 4, 1905.

Mr. H. B. Brooks described, by invitation, 'An Efficiency Meter for Incandescent Lamps' developed by Mr. Hyde and himself for use at the Bureau of Standards. The purpose of this is to give a direct reading of the quotient of the watts used by the candle-power; for commercial 16 c. p. lamps this quotient is three to four. A Weston wattmeter is used, but enough extra resistance is added in the shunt circuit (which has normally some 2,000 ohms resistance) to bring the deflection of the needle down to ten times the quotient, as from 64 to 40. Since this resistance must vary with the observed candle-power, part of it is wound on a block of carefully calculated form and a contact piece carried along with the photometer screen cuts out resistance as the candle-power increases. The instrument is reliable to about one per cent.

Mr. W. P. White then presented 'A Thermal Study of the Mineral Wollastonite' made by himself and Messrs. Allen and Wright. This substance, often found in lavas, was studied to get a probable limit to the temperature that the lava had reached.

Calcium metasilicate, $CaSiO_3$, exists in two forms; one, wollastonite, stable below about 1,180°, and a monoclinic form stable above that temperature. If wollastonite is heated, it changes readily to the other form, but to get the reverse change is often a matter of some difficulty. Hence, on cooling a charge of the melted material, if crystallization occurs, as it usually does, above 1,180°, pseudo-wollastonite is found. It is only now and then that the undercooling is great enough to allow wollastonite to crystallize. Wollastonite can be formed readily, however, by chilling melted material so that it becomes glassy at ordinary temperatures, and then heating this glass to a dull red heat. The melting point of the pseudo-wollastonite is 1,512°. Nine determinations on four separate samples showed a maximum variation of 2½° in the determination of this point.

In locating the inversion temperature in the electric furnace, great help was obtained by the use of control elements which gave simply the furnace temperature and enabled

allowance to be made for its fluctuation. It is well known that thermoelements deteriorate at high temperatures. This results in an incorrect reading and the error depends on the distribution of temperature in the furnace and, therefore, on the amount and nature of the charge which is being examined, etc. Trouble from this source was largely removed by comparing the working elements with standards which were used for so short a time as to hold their values practically unchanged for several months. The comparison must be made under exactly the conditions for which the temperature reading is intended. Thus for best results in the determination of melting points, comparison must be made during the melting. The relative error of a temperature measurement below 1,550° can in this way be brought within half a degree.

One conclusion from the work is that the temperature of lavas where wollastonite is found can not have exceeded 1,163°.

Charles K. Wead,
Secretary.

DISCUSSION AND CORRESPONDENCE.

DR. O. F COOK'S 'SOCIAL ORGANIZATION AND BREEDING HABITS OF THE COTTON-PROTECTING KELEP OF GUATEMALA.'

Some of the results of the continued work of the United States Department of Agriculture on the ponerine ant, *Ectatomma tuberculatum* Olivier, introduced into Texas for the purpose of aiding in the extermination of the cotton boll weevil, are given in this paper of fifty-five pages in advance of an illustrated bulletin or report on the same subject. Dr. Cook's paper can hardly be passed over without comment, since it displays so many misstatements of fact, such inadequate knowledge of the work that has been done on other species of ants, and such a wilderness of unkempt argument and speculation as to entitle it to high rank as an example of what a scientific essay should not be.

The burden or 'Leitmotiv' of the whole paper is properly sounded in the introduction, which is well worth quoting in its entirety:

In preceding reports treating of the kelep as an enemy of the cotton boll weevil the distinctness of its behavior from that of the true ants has been noted. To avoid in some measure the misapprehension likely to be caused by calling it an ant it seemed desirable to introduce with the insect its distinctive Indian name, *kelep*. In the minds of the natives of Guatemala, the kelep is not a kind of ant, but an independent animal not to be associated with ants. The more we learn about it the more this aboriginal opinion appears justified, not alone because the kelep is a beneficial insect, but because it has a different mode of existence and a different place in the economy of nature.

The popular classification of the social hymenoptera recognizes three types—the ants, the bees and the wasps, the ants being distinguished from the others by the absence of wings. The kelep falls, however, into none of these groups. To call it a wasp or a bee would not misrepresent the practical facts more than to call it an ant. In reality the kelep represents a fourth category of social hymenoptera, as distinct from the other three as they are from each other. Authorities on the classification of the hymenoptera have admitted a rather close affinity between the wasps and the ants, but the kelep differs from both of these groups and approaches the bees in important respects, and especially in those which affect the question of its domestication and utilization in agriculture.

It was naturally supposed at first that the kelep would have the same habits as the true ants which have been associated with it as members of the same family or subfamily, but the differences were greatly underestimated. If the hymenoptera were classified by a taxonomic system consistent with that applied to the higher animals, the kelep would need to be recognized as the type of a new and distinct family. It is, moreover, the first member of its family of which the habits have become known. Under such circumstances it was quite impossible, obviously, to determine in advance whether its habits and instincts would permit its colonization in the United States and its use in agriculture.

The fundamental difference between the ants and the kelep, and that in which the latter resembles the honey bee, lies in the methods of swarming. Among the bees and the keleps swarming results directly in the formation of new colonies, but the swarming of the ants is a distinct biological phenomenon having for its object cross-fertilization. The kelep is completely socialized, like the honey bee, while the ant is not. The keleps and the honey bees live only in communities, while the ants at one stage of their life